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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 04.02.2003

7

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/870,534

Applicant(s)

SRIVASTAVA ET AL.

Examiner

Lynette T. Umez-Eronini

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) 13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) 1-12, 14, and 15 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 4, 5, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Erk (US 5,340,437) in view of Datta et al. (US 5,462,638).

As pertaining to claims 1, 4, and 5, Erk teaches a method comprising the steps of:

immersing an article into a tank of etchant (column 7, lines 13-17).

Erk also teaches, "... the wafers are etched ... for a period of about 1 to 10 minutes ... wafers are rotated while they are in contact with the flowing etchant ... the wafers are rotated at a speed less than about 5 rpm" (column 4, lines 19-26). "As the etchant flows into the etch tank, ... the drive mechanism ... are rotated to cause the semiconductor wafers rotate ..." (column 7, lines 17-24 and column 8, lines 30-32), which reads on rotating the article while in the etchant for an amount of time so as to cause improved uniformity of etching of the film across the entire article compared to etching without rotating the article; and

removing the article from the tank of etchant (column 8, lines 38-42).

Erk differs in failing to teach the article contains a film having a plurality of solder bump on an article and immersing the solder bumps into a tank of etchant, in claim 1 and the film is a metallic film in claim 6.

Datta teaches, "After the solder bumps are formed, . . . The substrate now is covered with . . . solder bumps" (column 3, lines 10-12). "The etchant removes Ti-W . . ." It can be used with dip etching, which allows economical production with simple throughput cassette-type etching process" (column 7, lines 41-46). The former reads on the article contains a film having a plurality of solder bump on an article and the latter reads on immersing the article containing the film having a plurality of solder bumps into a tank of etchant, as in claim 1 and the above further reads on the film is a metallic film, as in claim 6.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Erk by immersing an article having a plurality of solder bumps as taught by Datta in a tank of etchant for the purpose of allowing economical production with simple throughput cassette-type etching process" (Datta, column 7, lines 44-46).

Since Erk in view of Datta use the same steps and film layer as those of the claimed invention, then combining Erk and Datta would inherently result in a method of improving the uniformity of etching of a film on an article as in the present invention.

3. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Erk (US '437) in view of Datta (US '628) as applied to claim 1 above, and further in view of Takeshi et al. (English Abstract of JP 9115977 A2).

Erk in view of Datta differs in failing to teach the step of rotating comprises sequentially rotating the article, **in claims 2 and 3**; and

sequentially rotating comprises rotating the article an amount but less than a complete rotating and repeating the steps of rotating and etching for an amount of time, **in claim 3**.

It is well known in the art that a complete rotation is 360 degrees. Takeshi teaches the steps of setting a fixed angular velocity so that the total angle of rotation becomes less than 360 degrees [0025 and 0028], which reads on rotating the article a predetermined amount but less than a complete rotation. Takeshi also teaches repeating the step of rotating and etching for an amount of time [0030], further reads on sequentially rotating comprises rotating the article an amount but less than a complete rotating.

It would have been obvious to modify Erk in view of Datta by using Takeshi's step of sequentially rotating an article for an amount but less than a complete rotation, and repeating the steps of rotating and etching for an amount of time for the purpose of improving the method of detecting defects in semiconductor processing.

4. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Erk (US 437) in view of Datta (US '638) as applied to claim 1 above, and further in view of Barbee (US '705).

Erk in view of Datta differs in failing to teach the film is a non-metallic film, in claim 7.

Barbee teaches a workpiece **20**, such as a semiconductor wafer comprises one or more film layers on a surface thereof, the film layers are either patterned or unpatterned (column 5, lines 42-50; column 7, lines 67 - column 8, line 7) and "... the removal of a conducting or dielectric film from the etched work piece **20** ..." (column 6, lines 63-64), which reads on the article containing a film being non-metallic.

Hence, it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Erk in view of Datta by using an article containing a film as taught by Barbee for the purpose monitoring an etching condition of a workpiece being etched which does not interfere with the impingement of an etchant upon a workpiece (Barbee, column 3, lines 17-21).

5. Claims 8, 11, 12, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Erk (US 437) in view of Barbee (US '705).

Erk teaches a method comprising the steps of:

immersing a semiconductor into a tank of etchant (column 7, lines 13-17);

Erk also teaches, "... the wafers are etched ... for a period of about 1 to 10 minutes ... wafers are rotated while they are in contact with the flowing etchant ... the

wafers are rotated at a speed less than about 5 rpm" (column 4, lines 19-26). "As the etchant flows into the etch tank, . . . the drive mechanism . . . are rotated to cause the semiconductor wafers rotate . . ." (column 7, lines 17-24), which reads on,

rotating the semiconductor wafer while in the etchant for an amount of time; and

"The wafers are etched . . . for . . . 1 to 10 minutes . . . the flow of liquid continues . . . and the etch rack is removed from the etch tank . . . to remove any etchant which may remain on the surface of the wafers" (column 8, lines 30-42) and " . . . the wafers are rotated at a speed less than 5 rpm . . ." (column 4, lines 19-21), which reads on,

removing the semiconductor from the tank of etchant), as **in claim 8**;

rotating comprises continuously rotating the semiconductor wafer an amount of time, as **in claim 11**; and

rotating the semiconductor wafer at a speed of 1 to 5 revolutions per minute, as **in claim 12**.

Erk differs in failing to teach the semiconductor contains a film having a plurality of solder bump on an article and immersing the solder bumps into a tank of etchant, in claim 8 and the film is a metallic film in claim 14.

Datta teaches, "After the solder bumps are formed, . . . The substrate now is covered with . . . solder bumps" (column 3, lines 10-12). "The etchant removes Ti-W . . ." It can be used with dip etching, which allows economical production with simple throughput cassette-type etching process" (column 7, lines 41-46). The former reads on the article contains a film having a plurality of solder bump on an article and the latter reads on immersing the article containing the film having a plurality of solder bumps into

a tank of etchant, as **in claim 8**. The above further reads on the film is a metallic film as **in claim 14**.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Erk by immersing an article having a plurality of solder bumps as taught by Datta in a tank of etchant for the purpose of allowing economical production with simple throughput cassette-type etching process" (Datta, column 7, lines 44-46).

Since Erk in view of Datta use the same steps and film layer as those of the claimed invention, then combining Erk and Datta would inherently result in a method of improving the uniformity of etching of a film on an article as in the present invention.

6. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Erk (US '437) in view of Datta (US '638) as applied to claim 8 above, and further in view of Takeshi (English translation of JP '977 A2).

Erk in view of Datta differs in failing to teach the step of rotating comprises sequentially rotating the semiconductor, **in claims 9 and 10**; and

sequentially rotating comprises rotating the semiconductor an amount but less than a complete rotating, and repeating the steps of rotating and etching for an amount of time, **in claim 10**.

It is well known in the art that a complete rotation is 360 degrees. Takeshi teaches the steps of etching a semiconductor by setting a fixed angular velocity so that the total angle of rotation becomes less than 360 degrees and etching for a fixed time

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[0025 and 0028], which reads on rotating the article an amount but less than a complete rotation. Takeshi also teaches repeating the step of rotating and etching for an amount of time [0030].

It would have been obvious to modify Erk in view of Datta by using Takeshi's step of sequentially rotating an article for the purpose of improving the method of detecting defects in semiconductor processing.

7. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Erk (US 437) in view of Datta (US '638) as applied to claim 8 above, and further in view of Barbee (US '705).

Erk differs in failing to teach the film is a non-metallic film.

Barbee teaches a workpiece **20**, such as a semiconductor wafer comprises one or more film layers on a surface thereof, the film layers are either patterned or unpatterned (column 5, lines 42-50; column 7, lines 67 - column 8, line 7) and "... the removal of a conducting or dielectric film from the etched work piece **20** ..." (column 6, lines 63-64), which further reads on the semiconductor containing a film being non-metallic, as in the claimed invention.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Erk in view of Datta by using an article containing a film as taught by Barbee for the purpose monitoring an etching condition of a workpiece being etched which does not interfere with the impingement of an etchant upon a workpiece (Barbee, column 3, lines 17-21).


Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.


BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 700

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March 31, 2003